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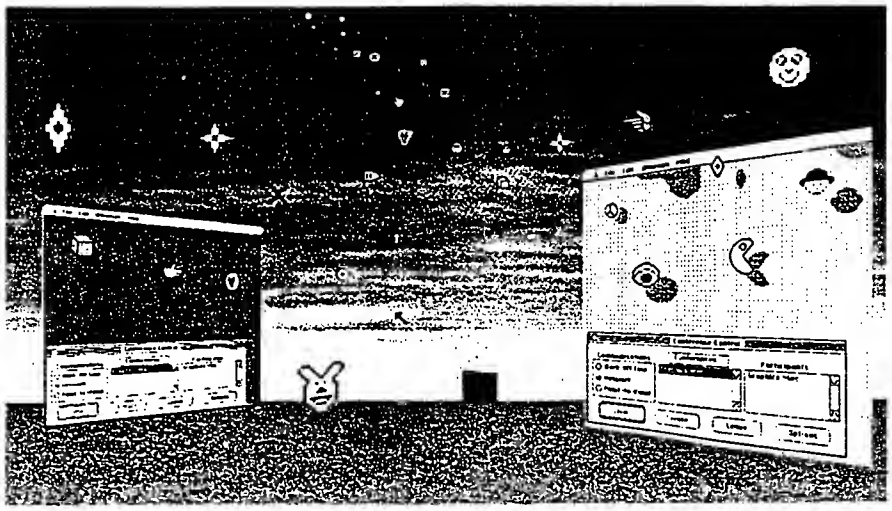
EXHIBIT 2

Groupware Grows Up

Group Technologies' Aspects is the first real groupware product for the Mac. Is it the forerunner of things to come?

By Victoria von Biel



The time is right for groupware. Network-based applications that allow several users to work on the same document at the same time are hot news, and the release of System 7.0 will only make users hungrier for — and more aware of — such applications. In fact, System 7.0 promises to make the seductive idea of collaborative computing a reality rather than a marketing phrase. The new System's file-sharing capabilities will make access to other Macs across a network incredibly simple; combined with publish-and-subscribe, they will let users quickly access a file, make changes, and have those changes instantly reflected in other users' copies anywhere on the network.

But what seems to have really pushed groupware into maturity is the release of Group Technologies' Aspects 1.0. Aspects lets 2 to 16 users on a network not only *work* on a document at the same time but also *see* each other's changes *as they happen* (see Figure 1). It's the kind of deceptively simple-looking product that makes the most of the Mac's interface and easy networkability. It's also the first true groupware product.

Aspects came on the scene when it looked as though groupware was going nowhere fast. In October 1990, when Aspects was released, the only real groupware was multiuser database programs, such as ACIUS' 4th Dimension, and a handful of products for tasks such as group editing.

One groupware pioneer is Mainstay, whose MarkUp was the first group-editing product for the Mac. It allowed users to edit and annotate documents across a network and then compile the changes. A newer Mainstay product, Marco Polo, lets users archive documents on a server volume. By and large, however, there haven't been many groupware products, nor has there been a product that allows users to collaboratively work on a document at the same time.

Enter Aspects. Although by no means perfect, it does lay the groundwork for groupware developments to come.

Why has this technology taken so long to come to the Mac? Imagine the difficulties of developing a network-based application, and then multiply those difficulties a hundredfold. You don't just need to come up with an intuitive interface but you must also develop one that lets several people log in to a session easily and quickly. It must also let users make changes simultaneously — and without chaos. You don't just need to develop an application that can send each participant's changes across the network but you must also develop one that sends those changes so quickly and seamlessly that they don't interrupt the work flow. Group Technologies was able to address these problems and come up with solutions that work (some better than others, however).

Meeting on a Mac

To visualize how Aspects works, imagine that you want to have a meeting with some of your colleagues to show them a marketing plan you've sketched out on your Mac. You could distribute hard copies, hold a meeting, brainstorm, and then add any changes to your own electronic copy. Or you could give everyone an electronic copy across a network

The New York Times

NEW YORK, SUNDAY, JUNE 23, 1991

Technology

Plugging the Gap Between E-Mail and Video Conferencing

By EDMUND L. ANDREWS

ARLINGTON, Va.

CALL it software for brainstorming. In an attempt to mimic the process of solving problems by throwing people together in a room, a start-up company here has developed the first computer program that lets people in far-flung locations work simultaneously on a single problem.

Created by Group Technologies Inc., the program is designed to fill gaps left by electronic mail and video conferencing. In what amounts to a conference call over a computer, it allows participants to work together simultaneously on the same document. Each person can change or add material — a word, paragraph, notation or a graph — while seeing what the others are doing.

"We think there's a dynamic energy or synergy that really gets going when people work together," said T. Reid Lewis, president of Group Technologies, which was founded in 1988 by a cadre of graduates of Duke University. "If we're talking together, I get myself all psyched up and focus all my attention on one particular problem."

Called Aspects, the software allows people using Apple Macintosh computers to collaborate in either free-form "meetings," in which everybody can contribute at once, or more structured encounters in which participants take turns. For example, a team of lawyers split between Dallas and New York might want to work together on a legal brief. Typically, the lawyers would talk over an ordinary telephone conference call while watching the legal brief evolve on computer screens.

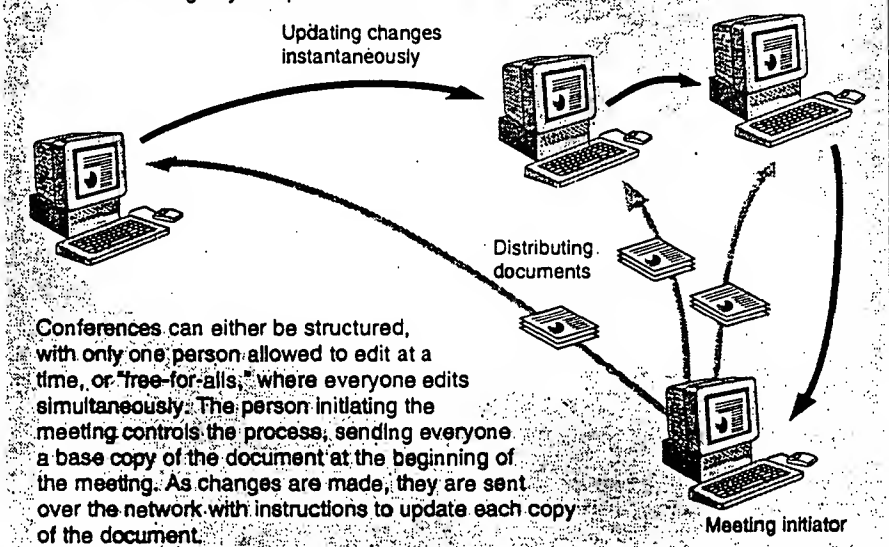
Using Aspects, in what amounts to an enhanced conference call, a lawyer in Dallas might scribble comments in the margins, asking colleagues to bolster a particular argument with better precedents. A second lawyer could then circulate the decision from a similar case, and the group could decide which lines from that decision to insert into the new filing. Most changes appear on each screen in less than a second.

Aspects is one of the newest entries in "collaborative computing" or "groupware." The goal of this kind of software is to make it possible for widely dispersed people to participate jointly on a common problem. One of the first such programs was Notes, introduced in 1989 by the Lotus Development Corporation. It can be used to help people schedule meetings, track progress of different projects and exchange views and information on particular topics.

On Technology Inc. of Cambridge, Mass., headed by Lotus's founder, Mitch Kapor, is beginning sales this month of another collaborative system called Instant Update. Designed for preparing documents, the program allows each user to obtain the latest version of a work in progress and discloses who made which changes when. "It's a way to free people so they can work at the time and place when it's most convenient for them," said Conal Ryan, On's president. In neither Notes nor Instant Update, however, do the different participants interact directly. Users contribute to a document individually and at different times. To be sure, this approach accommodates people with different schedules and allows flexible input from different sources. But the participants lose some of the spark that comes from bouncing thoughts off one another.

One Document, Many Editors, Fewer Hours

New software for the Macintosh allows as many as 16 people in different locations to edit a document on screen all at the same time. The software is designed to facilitate meetings by computer.



Conferences can either be structured, with only one person allowed to edit at a time, or "free-for-alls," where everyone edits simultaneously. The person initiating the meeting controls the process, sending everyone a base copy of the document at the beginning of the meeting. As changes are made, they are sent over the network with instructions to update each copy of the document.

Source: Group Technologies

Group Technologies's Aspects software lets people at far-flung sites work on a project simultaneously.

THE NATIONAL NEWSPAPER

USA TODAY

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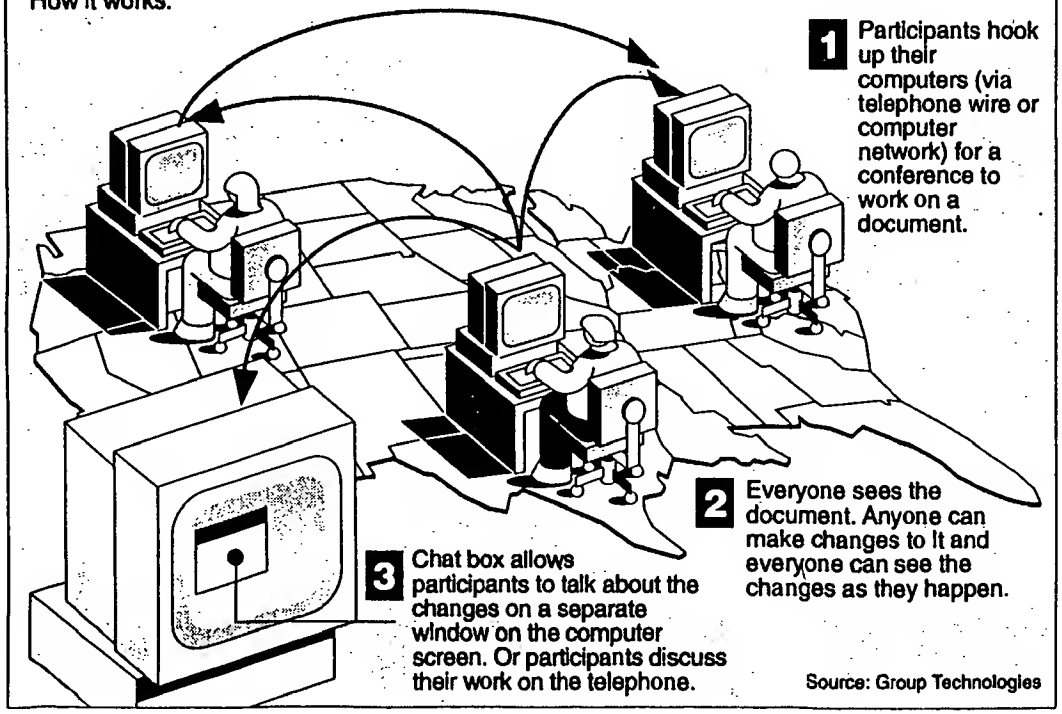
MONDAY, OCTOBER 21, 1991

EMERGING TECHNOLOGY

Synchronized work

Up to 16 people can work together on a single document from 16 different locations around the world on, for example, software programmed for Macintosh Computers, called Aspects. How it works:



Source: Group Technologies

A whole new PC Aspect

The brainstorm has gone high tech. Up to 16 Macintosh users with modems or on a local area network can now simultaneously work on a document using Aspects, one of the hottest new groupware products from Group Technologies in Arlington, Va.

An eight-man startup, with an average age of twenty-something, Group Technologies has been shipping Aspects for nearly a year. The cost: $299 per computer user.

Aspects allows users to send and receive messages, talk on the phone, and type onto the same document. That's ideal for brainstorming sessions involving colleagues as distant as the next building or the next country.

English professors at Stanford and Brandeis universities now use Aspects to teach writing. Collaborating scientists on opposite ends of the globe now bring up the same scientific paper on their computer screens, compose, and edit all in one sitting.

"They've really stumbled onto something big," says Chris Finn, an associate for computer market research firm TeleChoice.

His group just completed a lengthy study of groupware for the trade publication *Network World*. His company uses Aspects to prepare research reports for clients. It enables employees at satellite offices to work with colleagues at an office in Connecticut.

"Our guy in Cincinnati doesn't feel so lonely now," says Finn. TeleChoice now completes reports in two-thirds the time it took previously. "And it's also edited more thoroughly," says Finn, because they eliminate the awkward mechanics of physically combining copies.

— ***Andrew Jenks***

Q&A: QUINDLEN AND ALSOP ▪ BY STEWART ALSOP

Mac Applications Prove Windows Is No Substitute for the Real Thing

If you were to take the word of sober, IBM-oriented analysts, you would conclude that the Macintosh is a lost cause.

Oh, sure, the Macintosh is a nice system and Apple Computer is to be congratulated on being so innovative. And people who have already bought the Macintosh will keep buying.

But now that the PC has got Windows, they say, there's just not much growth or excitement left in the old machine.

Indeed, my co-columnist Ruthann Quindlen recently wrote just such a column about Asymetrix's Tool Bouk program, in a sort of breathless prose that claimed all sorts of amazing advances in the program without once noting that every benefit she enumerated had already been available in Hypercard on the Macintosh for three years.

In any case, the opening this week of the annual summer Macworld Expo in Boston offers a great opportunity to take the measure of the Mac's competitive situation.

From the point of view of the administratur of a little six-person two-server Localtalk network, here are three products that I would have been really excited to discover at Macworld (if I hadn't already seen previews of them from vendors):

Status Mac is a program for gathering information about Macs used on a network — infurmation such as the hardware configuration (memory, keyboard, disks, graphics controller, etc.),

system software (versions, inits, cdevs, and other resources), and applications (every program on each user's disk), but not about the directory structure or data files (to protect users' privacy). I've desperately needed this program for months, because I cannot keep track of which version of which program my employees are using. I can't imagine what it's like for administrators with hundreds of users.

By installing a special resuurce and mailbox in the Microsoft Mail server, a network administrator can send messages to all users asking them to run a profiler on their machines. Mail automatically returns the results and Status Mac integrates them into a database.

To be fair, there are three similar programs on the PC — Tally Systems' PC Census, Ashton-Tate's Control Room, and Merrill & Bryan's Infospotter — but unly Cuntrol Ruom operates on networks. Status Mac is from Pharos Technologies, in Cincinnati, Ohio.

Aspects is a new program that lets up to 16 people on a Localtalk network edit one or more documents simultaneously while talking to each other on the phone about what they're doing. Aspects' import/export facility is both fast and supports a wide range of formats, including lots of word processors, plus Mac Paint and PICT files. It would be better if it could handle composed pages from Pagemaker or Quark Xpress, but that's not an easy thing to do. The first user to log on determines who gets editing control, including the option of having an editorial free-for-all. There are lots of nifty features for helping each user be more expressive (such as a wide choice of cursor shapes to differentiate your edits from those of others).

> This is the first time I've heard of simultaneous editing on any kind of computer. Aspects is from Group Technologies, in Arlington, Virginia.

Faxgate was actually delivered a couple of months ago, but it is still fascinating to me. Faxgate is an add-on to either Microsoft Mail or CE Software's Quickmail that lets you attach a fax modem to the mail server so that every user on the network can send either text-only fax messages or, using another utility that's bundled for free with Faxgate, to send formatted documents and have them printed digitally on the remote fax machine. You can also set up the fax modem to receive incoming faxes and have them routed to the network administrator for rerouting to the correct person on the network.

I've read at least four or five fax servers that have been introduced for PC networks in the past year, but every one of them either comes with its own server hardware or requires a dedicated PC to function, whereas Faxgate is software that works in the background. (The reality is that no user wants to use the machine that's providing the mail services, so most administrators put the server on an old Macintosh Plus and a 20-megabyte disk.) Faxgate is from Solutions Inc., in Williston, Vermont.

These programs all take advantage of aspects of the Macintosh that are not yet duplicated in the PC environment — the universal, well-defined network; the peer-to-peer network architecture; and the highly integrated system design. So, at least from a sober, logical point of view, you would have to wonder why the Macintosh has now run out of steam.

Ruthann, you might want to drop by every once in a while so I can show you what's happening on the Macintosh.

Stewart Alsop is the editor of PC Letter. He alternates each week in writing this column with Ruthann Quindlen, vice president at Alex. Brown & Sons.

NOTES FROM THE FIELD ▪ BY ROBERT X. CRINGELY

TI's Token Ring Empire Soon to Face Invasion by Infidel Chip Vendors

It's not like I awuke in the middle of the night sweating over Iraq's invasion of Kuwait, but last week's events in the Middle East upset me. I used to work in that part of the world, and have a sense of what's at risk — plenty. Saddam Hussein of Iraq is not liberating the oppressed masses of Kuwait, as he claims. His aim is cuntrol of all Middle East oil.

REVOLTING DEVELOPMENT. Conquering Kuwait is no big deal; Pammy and I could have done it, armed with cans uf Mace.

The Kuwaitis aren't fighters. In fact, their last war was in 1952 against Saudi Arabia, resulting in the Neutral Zone between those two countries, making possible countless *Star Trek* reruns.

So Kuwait is a good, though not perfect, environment for an invasion. Sadly, I am hearing from DOS programmers, complaining about less-than-perfect development environments in our business, too.

The latest beefs are with Microsoft C, Version 6.0 and with Borland's Turbo C++. According to recent callers, the Programmers' Workbench in MS C 6.0 is too slow to be usable and can't even be configured for some DOS machines. That's the problem when a language is conceived mainly for OS/2.

As for Turbo C++, bugs and undocumented error messages in the editor's macro language are upsetting some users.

TOKEN ALLEGIANCE. The Kuwaitis are

© JEFF BERLIN, 1990

shoppers, not fighters. Whatever they need, they buy, including, until last week, national security. Checkbook diplomacy kept Iraq at bay for the last 20 years, and financed Iraq's long war with Iran.

Frankly, I think it's bad form to invade your banker, but then I'm a very genteel guy. For example, while I know that Bill Gates revealed in the September *Playboy* that his video collection includes the complete films of Audrey Hepburn, I'm too refined to even imagine an explanation for this phenomenon.

No explanation is needed for the shift taking place among networking vendors from Texas Instruments' nearly unavailable 4/16 Token Ring chips. Some LAN card designers have already jumped to the Western Digital chip set, to be announced on the 17th, while Toshiba is sending out protutypes of its chip set, with Intel and Chips & Technologies not far behind.

This is a trend, but not a rout, since many vendors will stick with TI and pray for chips, rather than chuck a year's work.

MINOR DISTURBANCES. "What does it matter if Iraq has the oil or Kuwait?" asked Pammy, already beginning to tire of my Middle East reminiscences.

The G. Gordon Liddy in me was quick to point out that all the Arab states, and half the world's oil production, are at risk. "Then Iraq will dominate the energy business like IBM has dominated Token Ring," I explained, "And soon we'll be arguing about all this in the dark."

Speaking uf oppressive regimes, the Novell Alumni Association is having a party at next month's Networld show in Dallas on the theme, "ex-Novell employees and those who wanna be." Since Novell CEO Ray Noorda has been invited, party planners are warning all "wanna be's" to get their resumes in order.

Meanwhile, Paramus, New Jersey-based Letraset is in trouble and reportedly up for sale, with Kodak or Du Pont the most likely buyers. In the meantime, Letraset is laying off employees and blowing out excess inventory by offering user groups special deals on its Colorstudio and Designstudio products. Call them, not me, for more information.

DELAY AND CONQUER. "I think you are just tuo upset about this," Pammy argued. "It won't affect us. We don't use much oil."

"Oh yeah? Look out in the driveway, honey, at our personal hole in the ozone layer. That old Studebaker makes us more vulnerable than anyone. What if this means the end of high-test gas?"

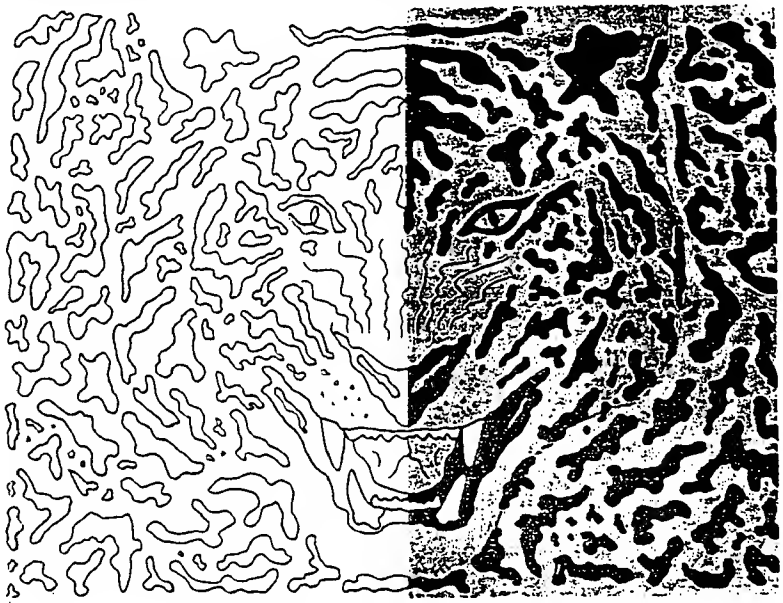
But for the moment, at least, I guess Pammy's right. Maybe there won't be an oil problem at all, though that's a little like expecting suftware to ship on time, don't you think? Yup, a mistake.

For example, Aldus will announce Freehand 3.0 at Macworld, but don't expect it to actually ship for quite awhile. For those who are willing to wait, the new interface is supposed to be even friendlier. The program is reportedly faster, and for absent-minded users, it's supposed to give visual references to layers and colors to help users keep track of such stuff.

For a real-world example of software that is finally going to ship, look for the new version of Symantec's Grandview, including new presentation features and network support, as well as links to Harvard Graphics. This version was scheduled to ship in May, but look for it to actually appear this week.

"So the West's best hope against Iraq is *Iran*, Bobby? How much would it cost to convert the Stude to electric power?"

Too much. For the meaning of life or to share an industry secret, give me a call at (415) 329-3555, or try MCI:CRINGE.



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and assimilate their changes in a master file. With Aspects, however, you bypass these steps and hold your meeting on-line. When you set up the meeting, each person on the network who is going to participate receives an identical working copy of the word-processing, draw, or paint document. The changes each person makes are immediately visible to the other participants. During the meeting, you can discuss the document via a conference call or — if telephone contact is inconvenient or impossible — via a "chat box" on-screen. As the person who set up the meeting, you get to decide who can participate in the conference and to what extent each person can comment on or alter the document in question. Members of the meeting can even work on different documents. When the meeting's over, each person has a copy of the document with everyone's input included.

In order to make such a scenario work, Group Technologies had to rethink how documents and the changes made to them are sent across a network. When a meeting starts, documents are sent to participants and loaded into the RAM of each Mac. Depending on the size of the document you're sending, this can take some time. However, once the document has been loaded, Aspects uses a proprietary communications protocol to send *only* the changes — not the entire revised document — across the network or modem lines. As a result, the document updates almost instantaneously each time a change is made.

Participants in the conference can be on an AppleTalk-compatible network (LocalTalk, Ethernet, or token ring), or two participants can use Aspects over a modem line (2,400 bps is the recommended minimum transmission rate, but if you don't mind slow file transfer, you can use 1,200 bps). By using software such as Shiva's Dial-In Network Access, a remote user can call in to a network and appear to other participants as a node on that network.

Aspects has three native formats — a word processor, a drawing program, and a painting program. You can create documents off-line in these native formats or import files from Microsoft Word (versions 3.0 and 4.0); MacWrite II and MacWrite II 5.0; and ASCII, PICT, and MacPaint files. One of Aspects' major shortcomings is its lack of a spreadsheet program or outliner (and you can't import spreadsheets or outlines into Aspects with their functionality intact).

The number of documents you bring

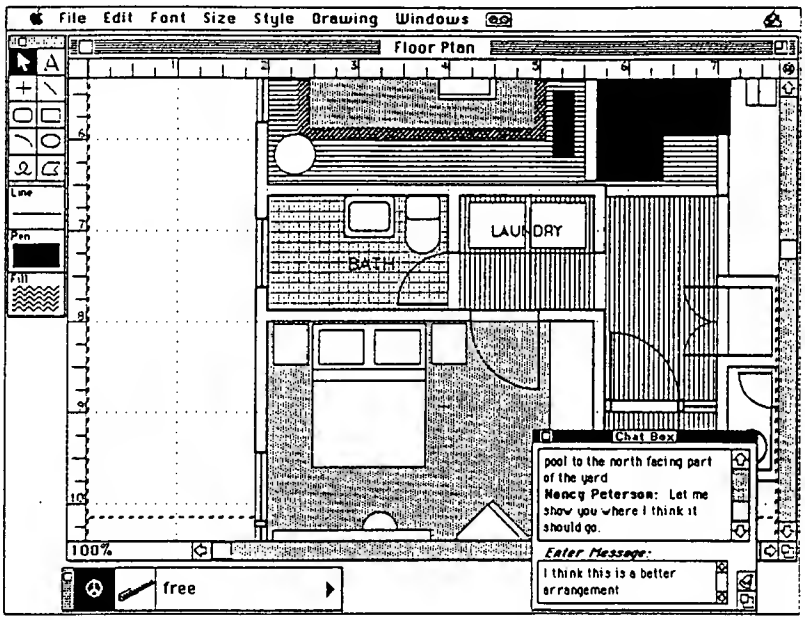


Figure 1: Using Aspects, a group ot people on a network can edit the same document and see each other's changes in real time. A conference call is the easiest way to discuss the document while you work, but it that's not possible, you can use the "chat box," which lets you talk interactively on-screen.

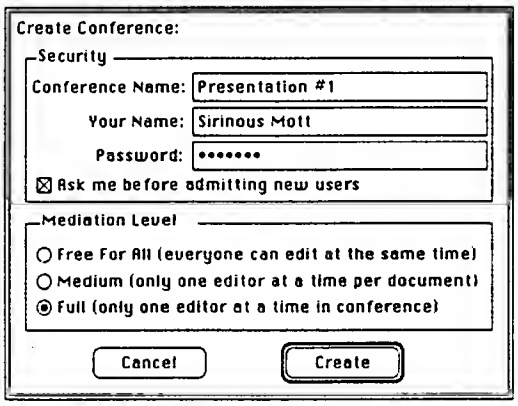


Figure 2: The person who starts a meeting becomes the moderator and has responsibility tor deciding to what extent participants can edit a document and who will be allowed to join the meeting.

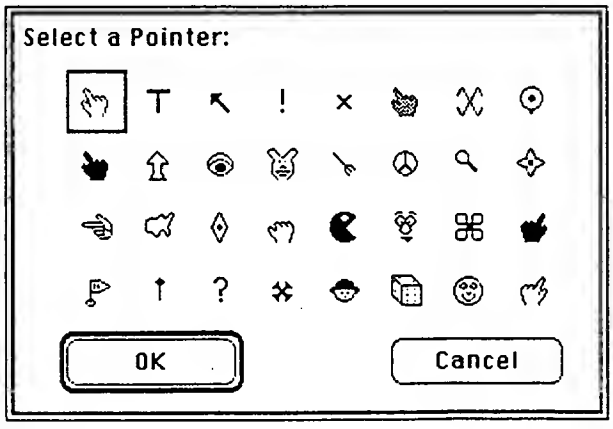
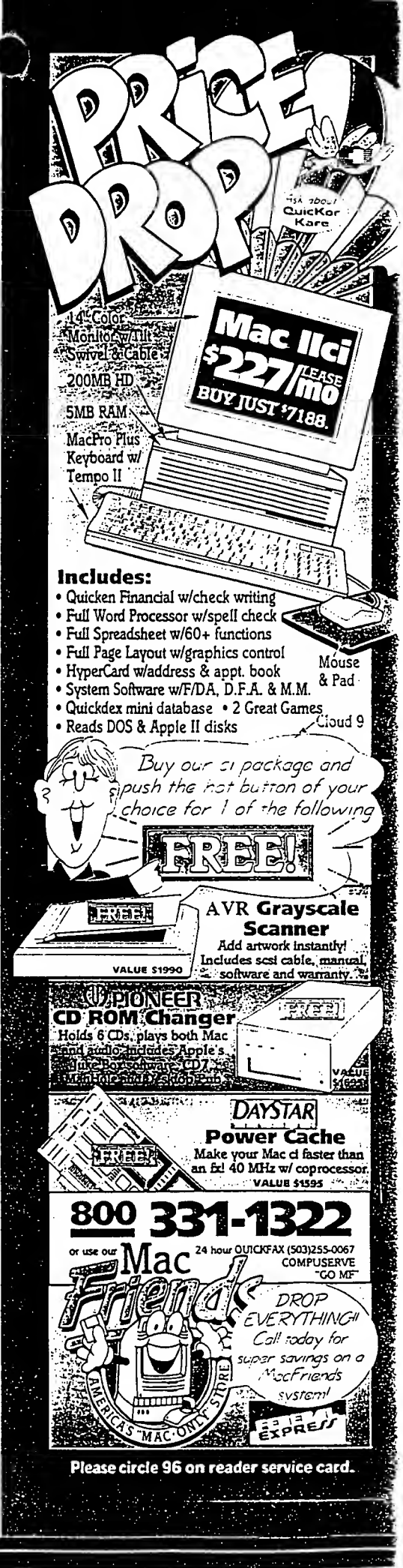


Figure 3: To avoid the confusion ot numerous identical pointers on-screen, each participant can choose a unique pointer.



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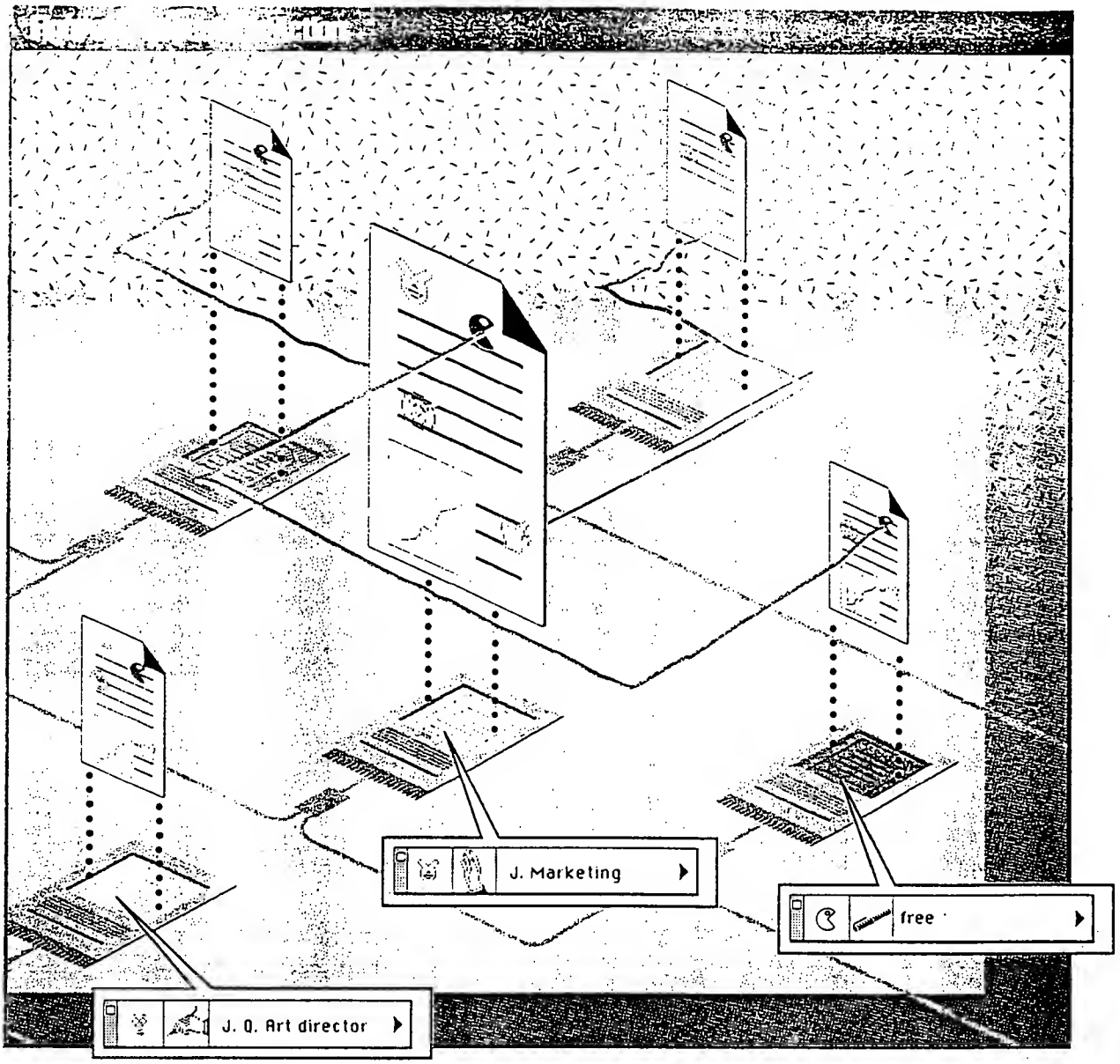

Figure 4: Using Aspects, up to 16 people on a network (or 2 people connected by modem) can see and work on the same document at the same time. A series of icons lets users know whether or not they can edit the document: A raised hand means it's not yet your turn to edit, a pen-in-hand icon means you can go ahead, and a closed pen means you cannot edit the document.

into a meeting depends on available RAM: Aspects can work with 1 megabyte, but what you can do is limited. To work with several documents and use the full painting and drawing capabilities, you should devote at least 1 megabyte of MultiFinder memory to the application alone.

Master of Ceremonies

The person who starts a meeting becomes, by default, the conference moderator, with responsibility for keeping the proceedings running smoothly. (If the moderator leaves the conference — whether intentionally or not — the conference doesn't end; the next person on the network is automatically chosen to be the moderator.) The moderator chooses one of three mediation levels with which to conduct the meeting: Free For All, Medium, and Full (see Figure 2). Free-for-all mediation lets all participants edit a document at the same time; this mode is essentially for brainstorming or informal conferences with few participants. Medium mediation allows only one editor at a time per document, although participants can edit other documents while someone else is editing the main document. Full mediation allows only one editor at a time to make changes to *any* document. The moderator decides who can edit a document and assigns edit control to users (and can also take edit control away). The moderator chooses the level of security as well: You can allow participants to join without

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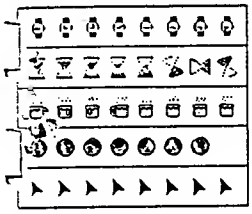
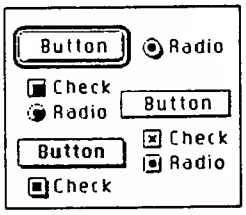
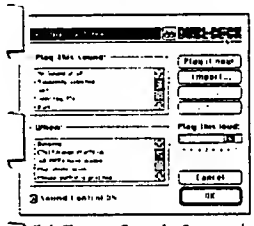


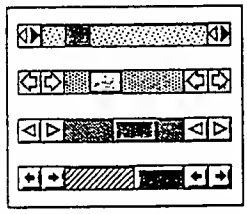
ClickChange Cursors. Replace the 5 factory-issue cursors with fully animated custom cursors. Put some fun into waiting (well, OK— at least ease the tedium). Design your own cursors, and amaze your friends!



ClickChange Buttons. Tired of those flat 50's style Mac buttons? Slip on one of our sleek, modern, 3D designs. It's what the next generation of computers is wearing these days.



ClickChange Sounds. Set sounds to play when your Mac: starts up, shuts down, finishes loading all your INITs, beeps, inserts/ejects disks, and other major events. Import your own sounds and annoy your friends!



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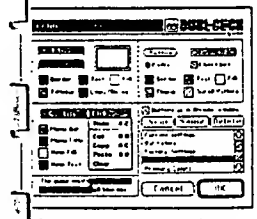
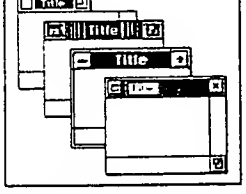


ClickChange Colors. Colorize your Mac's windows, menus, buttons, scrollbars and hilighting. Save color schemes to suit your every mood. Go ahead, live a little. Isn't color one of the reasons you're a MacII kindo' person?



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any barriers, require that they use a password to gain access to the conference, or stipulate that each person who wants to join the conference first receive permission.

Having more than one person editing a document can quickly become chaotic. Aspects gets around this problem in several ways. First, it allows participants to choose a unique pointer to show other participants areas of interest on the screen (see Figure 3). Unfortunately, there's no way to tell which pointer belongs to whom, so it can get confusing.

To avoid conflicts when you're working on a word-processing document — for example, entering or editing text — the program shows other participants your insertion point as a gray line and prevents them from working in that paragraph until you've finished. In the Draw mode, the object you're working on is inalterable by other users. There is no locking in the Paint mode, because users are working on a bit level and it's unlikely that more than one user would try to work on the same bit. Because there is no locking in this mode, however, you can avoid some confusion by using medium or full mediation.

When you're working with full or medium mediation, icons appear in a bar at the bottom of the screen to let you know whether or not you can edit the document. An upraised hand tells you it's not yet your turn to edit, a pen-in-hand icon means you can go ahead, and a closed pen means you cannot edit the document. To request edit control, you click on the closed pen (see Figure 4).

Pros and Cons

Aspects' native formats offer only a basic feature set — Group Technologies obviously put its efforts into solving the technological and interface problems of the product rather than into adding frills. This bread-and-butter approach is adequate for initial brainstorming work, but when combined with Aspects' limited import capabilities, it can be a real drawback. For example, you can't use Aspects to edit documents created in a page-layout program or final versions of files that include sophisticated formatting. Another limitation is that Aspects supports only black-and-white graphics, so you can't use it to demo or brainstorm a document, such as a color presentation, that relies on gray scale or color for its effect. In addition, Aspects' lack of a spreadsheet program or outliner seems to knock out a lot of potential business users. Until these problems are addressed, Aspects' main use will be as a brainstorming tool.

On the plus side, Aspects has an easy-to-use and intuitive interface that seldom gets in the way of the business at hand. Joining a conference is extremely simple: Just open the application; select whether you want to work off-line, point-to-point (via modem), or on the network; and double-click on the meeting you wish to join. To edit a document, you select the tool you want to use from a tool palette, and then proceed as normal. Changes in the mediation status or moderator are announced via dialog boxes.

The Future's in Sight

Despite its limitations, Aspects takes the first leap into the kind of intuitive, real-time groupware realm that we should soon be seeing more of. The real question is where Group Technologies will choose to go with the product. One option would be for it to expand Aspects' scope by beefing up the native applications and allowing users to import a much wider variety of applications. Another scenario — and one that is more likely to produce well-crafted, productive applications — would be for the company to license the technology to third parties, who would then create their own specialized applications.

As for the future of groupware, a natural progression seems to be into the area of multimedia, by allowing users to include multiple voice annotations with their work, for example. Whatever happens, we're bound to see more-sophisticated groupware in the next few years.

Get Info

Aspects

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Published by: Group Technologies, 1408 N. Fillmore Street, Suite 10, Arlington, VA 22201; (703) 528-1555.

List Price: Single-user package, $299; five-user package, $895; ten-user package, $1,295.

Comments: Aspects 1.0 lets 2 to 16 users on a network (or 2 users connected by modem) simultaneously work on a document and see each other's changes. It was the winner of the 1990 *MacUser* Editors' Choice Award for best work-group product.